# Intracranial hypertension stent

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Policy contains: idiopathic intracranial hypertension, pseudotumor cerebri, venous sinus stent.

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## Coverage policy

Venous sinus stents for intracranial hypertension are investigational/not clinically proven and, therefore, not medically necessary.

Limitations

No limitations were identified during the writing of this policy.

Alternative covered services

- Diuretic medication therapy (e.g., acetazolamide).
- Shunting (insertion of tube into brain).
- Weight loss support and consultation.

## Background

Idiopathic intracranial hypertension, also known as pseudotumor cerebri, is a condition marked by persistently increased intracranial pressure, papilledema, and radiological findings with no known identifiable origin (Wang, 2022). Incidence for all ages is approximately one in 100,000 persons, and is highest in overweight women ages 20 to 44 years, estimated at 19 in 100,000 (Daggubati, 2019).

Common symptoms of intracranial hypertension are often nonspecific and may include headache, transient visual obscurations, pulse synchronous tinnitus, photopsia, retrobulbar pain, diplopia, and visual loss. While the pathophysiology of idiopathic intracranial hypertension is poorly understood, likely causative factors are cerebral spinal fluid dysregulation and dysfunction and increasing venous sinus pressure (Wang, 2022).

The criteria used to diagnose idiopathic intracranial hypertension include signs and symptoms attributable only to elevated intracranial pressure; cerebrospinal fluid opening pressure of greater than 25 centimeters $H_2O$; normal cerebrospinal fluid composition; and no evidence after neuroimaging of mass lesion or other structural causes. Fundoscopy, optical coherence tomography, neuroimaging (often magnetic resonance imaging), and lumbar puncture with manometry are used in diagnosis (Friedman, 2013).

Multiple treatment options for idiopathic intracranial hypertension exist. Weight loss remains the only established therapy that changes the disease process typically for patients with a baseline body mass index > 35 $kg/m^2$ as first line treatment in the absence of fulminant disease (Wang, 2022). Monitoring of psychosocial issues is important, although consensus is lacking in standardized measures. The most common medical treatment is acetazolamide — a diuretic and carbonic anhydrase inhibitor — sometimes combined with other drugs (Thurtell, 2021).

Surgical treatments in cases refractory to conservative approaches include various approaches to shunting cerebrospinal fluid, optic nerve sheath fenestration, and cerebral venous sinus stents (also known as intracranial hypertension stents). The stenting procedure involves cerebral angiography with a guide catheter introduced through femoral artery puncture, while venography and venous manometry are performed under conscious sedation via femoral vein access, with a shuttle catheter positioned at the internal jugular vein. Venous stents, placed under general anesthesia, span 10 millimeters pre-stenosis and post-stenosis (Daggubati, 2019).

In March 2026, the Food and Drug Administration granted a Humanitarian Device Exemption (H230002) to the River stent, the first venous sinus stent designed specifically for idiopathic intracranial hypertension (U.S. Food and Drug Administration, 2026); other stents used for the procedure are cleared for peripheral or other vascular uses and applied off label.

## Findings

Guidelines

A consensus guideline issued by four British professional medical societies on management of idiopathic intracranial hypertension does not recommend neurovascular stenting for either visual loss or headache alone, as the role of the procedure is not established. Reasons include observed complications, lack of long-term data on efficacy and safety, and methodological limits, i.e., studies are mostly case series, not randomized, and have small sample sizes (Mollan, 2018).

A guideline from the European Headache Foundation states that, while some institutions employ venous sinus stenting to treat idiopathic intracranial hypertension, “utility is debated.” This guideline also does not recommend the procedure for treating headaches in persons with the disorder (Hoffmann, 2018).

A guideline from the Royal College of Physicians states ventriculoperitoneal shunts can be used to divert cerebrospinal fluid, and that optic nerve sheath fenestration is an alternative to treating intracranial hypertension. However, the ability of endovascular stenting to improve long-term outcomes is uncertain (Wakerley, 2020).

The American Academy of Ophthalmology has not issued professional guidance for idiopathic intracranial hypertension, but a related article on the Academy's website indicates the general low quality evidence for venous sinus stenting that cannot address the true complication rates and comparative effectiveness relative to more established shunting procedures. The authors agree that a head-to-head controlled clinical trial is necessary to answer these questions. While standard criteria for venous stenting are lacking, there is general agreement that venous sinus stenting may be considered when patients have failed or are intolerant to maximum medical therapy, have a documented venous sinus pressure gradient on manometry, and have failed, refused, or are not an appropriate candidate for cerebrospinal fluid shunting or optic nerve sheath fenestration (Lee, 2024).

Consensus recommendations from the Austrian network for idiopathic intracranial hypertension, developed by a modified nominal group technique across neurology, ophthalmology, neuroradiology, neurosurgery, and endocrinology, place venous sinus stenting in the most refractory tier of a three-stage treatment pathway (Bsteh, 2025). Stenting appears only at stage 3, reserved for patients with moderate to severe papilledema (Frisén grade 3 or higher) or progressive visual loss despite maximal medical therapy, and only after interdisciplinary board review. It is the single invasive option the consensus labels experimental; lumbar drainage, ventriculoperitoneal shunting, and optic nerve sheath fenestration carry no such qualifier.

The recommendation states that "in centers with proven expertise, venous sinus stenting may also be considered as an experimental option, provided that a high-grade sinus venous stenosis with a significant pressure gradient (≥ 8 millimeters of mercury) is confirmed by conventional digital subtraction angiography with venous manometry." No grade of recommendation, level of evidence, or supporting trial is attached to the statement, and the authors caution that their recommendations "reflect the grade of agreement reached during the consensus process, rather than the strength of empirical evidence" and are "intended as guidance for clinical decision-making, not as prescriptive standards of care." The consensus is positioned as a supplement to existing international guidelines, including Mollan (2018) and Hoffmann (2018).

Evidence reviews

Patients who fail conservative measures are referred for cerebrospinal fluid shunting or optic nerve sheath fenestration, but venous sinus stenting is increasing in popularity in the United States. From 2016 to 2020, the number of venous sinus stenting procedures increased 80%, while the number of cerebrospinal fluid shunting procedures and optic nerve sheath fenestration procedures decreased 19% and 54%, respectively (Khunte, 2023).

The evidence base reported in the analysis below comprises non-randomized and single cohort studies of short duration, together with one prospective single-arm multicenter trial. Most participants were female and obese. Weight loss, acetazolamide therapy, and surgical interventions prior to venous sinus stenting were reported inconsistently. Venous sinus stenting appears to be efficacious for improving symptoms associated with idiopathic intracranial hypertension in patients who do not respond to medical therapy or have significant neurological or visual symptoms. Major complications and adverse events are infrequent, but rates of treatment failure, recurrence of idiopathic intracranial hypertension, and restenosis are variable.

A systematic review and meta-analysis of 36 non-randomized studies included 1,066 participants with medically refractory idiopathic intracranial hypertension (Azzam, 2024). The mean age at stenting was 33 years (range 13.4 to 41.8 years), and the mean follow-up time was 17.4 months (range three to 49 months). Most participants were female with a mean body mass index of 34.3 kilograms/$m^2$ (range 24.1 to 41.5 kilograms/ $m^2$). The mean time to stenting since diagnosis was 22.9 months. Venous sinus stenting was performed as a first-line surgery

in 78% (265/341) and as a second-line surgery in 18.9% (71/374). The overall risk of bias in the included studies was graded as moderate.

There was a significant reduction in trans-stenotic gradient pressure and lower cerebrospinal fluid opening pressure following venous sinus stenting. Symptomatic improvement in tinnitus (95% of participants), papilledema (89%), visual disturbances (88%), and headache (79%) occurred following the procedure. Treatment failure, defined as worsening symptoms and recurrence of idiopathic intracranial hypertension, occurred in 8.35%. The major complications and adverse events rate was 3.93%, including subdural hematoma, subdural hemorrhage, worsening of headache, and visual impairment. The minor complications and adverse events rate was 2.72%, including transient headache, retroorbital pain, and neck hematoma (Azzam, 2024).

A systematic review and meta-analysis of 24 studies compared the rates of restenosis and symptom recurrence in 694 participants (781 total venous sinus stenting procedures) with ophthalmological and neurological symptoms refractory to previous therapies. The mean age was 33.9 years, and the mean body mass index was 35.3 kilograms/$m^2$. After the procedure, 77.7% experienced symptom improvement, and 22.3% had persistent or worsened symptoms. The pooled restenosis rate was 17.7% (Lim, 2024).

A systematic review of 109 studies compared outcomes for various types of surgery for idiopathic intracranial hypertension. Venous sinus stenting improved papilledema, visual fields, and headaches in 87.1%, 72.7%, and 72.1% of patients, with failure and complication rates of 2.3% and 11.3%, respectively. Less efficacy and safety resulted after cerebrospinal fluid diversion (78.9%, 66.8%, 69.8%, 9.4%, and 43.4%), and optic nerve sheath fenestration (90.5%, 65.2%, 49.3%, 2.2%, and 9.4%) (Kalyvas, 2021).

A meta-analysis of 29 studies (n = 410) assessed outcomes of patients who underwent dural venous sinus stenting for refractory idiopathic intracranial hypertension. Technical success was 99.5%, the rate of major complication rate was 1.5%, and repeated procedure occurred in 10% of cases (Leishangthem, 2019).

A systematic review/meta-analysis of 20 studies (n = 474) of intracranial venous sinus stenting for idiopathic intracranial hypertension included 88% females with a mean age of 35 and a mean mass body index of 35 kg/$m^2$, who were followed for a median of 18 months after treatment. The review reported rates of papilloedema improvement (93.7%), headache improvement/resolution (79.6%), and pulsatile tinnitus resolution (90.3%). The rate of symptom recurrence was 9.8%, and major complications occurred in 1.9% of patients (Nicholson, 2019).

The first prospective, multicenter, single-arm trial of a purpose-built venous sinus stent (the River stent) enrolled 39 adults with idiopathic intracranial hypertension across five United States centers (Patsalides, 2026). Participants were 97.4% female with a mean age of 35.7 years and a mean body mass index of 35.4 kilograms/m². Stenting was technically successful in all 39 patients, reducing the mean trans-stenotic pressure gradient from 18 to 1.7 millimeters of mercury and the cerebrospinal fluid opening pressure from 32.9 to 21.5 centimeters $H_2O$ at one year. The primary safety endpoint, a major adverse event rate of 5.4%, was met against a prespecified 51.7% performance goal for cerebrospinal fluid shunting ($P < 0.0001$); including a delayed gastrointestinal hemorrhage, three major adverse events occurred (8.1%). The primary benefit endpoint was achieved in 60% of the 20 patients with complete one-year data (95% confidence interval 36.1% to 80.9%), with follow-up degraded by the COVID-19 pandemic. Headache scores improved in 85.3% of patients, papilledema resolved to Frisén grade 0 or 1 in 97%, and there were no strokes. On March 30, 2026, the device received a Food and Drug Administration Humanitarian Device Exemption (H230002) for adults 22 years and older with idiopathic intracranial hypertension refractory to or intolerant of medical therapy, venous sinus stenosis greater than 50%, and a trans-stenotic gradient of at least 8 millimeters of mercury; a Humanitarian Device Exemption is granted on a probable-benefit standard and does not establish equivalence to a full premarket approval.

A multinational, retrospective, propensity-matched cohort study using a federated electronic health record database compared transverse venous sinus stenting with cerebrospinal fluid shunting in 2,450 matched patients (1,225 per arm) with idiopathic intracranial hypertension (Intrapiromkul, 2025). At one year, stenting was

associated with a lower rate of repeat intervention (9.6% versus 38.6%; odds ratio 0.17, $P < 0.001$), less residual headache (34.9% versus 49.1%), fewer residual visual disturbances (22.9% versus 32.3%), and fewer unplanned readmissions (24.1% versus 40.5%). Persistent pulsatile tinnitus was more common after stenting (6.7% versus 2.2%; odds ratio 3.18, $P < 0.001$). The database design could not confirm diagnoses manometrically or capture opening pressure, stenosis severity, technical success, or procedural complications.

A 2026 systematic review of 19 studies and 1,210 adults with medically refractory idiopathic intracranial hypertension found consistent correction of the trans-stenotic pressure gradient to near zero after stenting, with papilledema improvement in 36% to 100%, headache improvement ranging widely from 13% to 100%, major complications in 0% to 9.6%, and reintervention in 0% to 26% (Figueroa-Sanchez, 2026). Using the GRADE framework, the authors rated the certainty of evidence as very low for all outcomes, citing serious risk of bias, the absence of any randomized trial, and reliance on heterogeneous, largely retrospective single-center cohorts. They concluded that venous sinus stenting remains a plausible option for carefully selected patients rather than a validated standard of care.

A systematic review and meta-analysis of surgical treatments for pediatric idiopathic intracranial hypertension pooled 54 studies and 150 children, of whom 37 underwent venous sinus stenting (Christie, 2026). Stenting improved headache in 84% (95% confidence interval 65% to 94%), papilledema in 86%, and visual acuity in 70%, with a reintervention rate of 30%. None of the differences among stenting, cerebrospinal fluid shunting, and optic nerve sheath fenestration reached statistical significance; the higher reintervention rate after stenting was attributed to stent-adjacent stenosis in growing pediatric sinuses.

In 2023, we updated the references and added a systematic review of 27 studies with an average sample size of 27 participants that confirmed serious limitations in the evidence base, notably a lack of ophthalmological outcomes associated with dural venous sinus stenting for treating medically refractory idiopathic intracranial hypertension (Kabanovski, 2022). No policy changes are warranted.

In 2024, we removed older references and added two new systematic reviews/meta-analyses to the policy. No policy changes are warranted.

In 2025, we reviewed a case series and systematic literature review that evaluated endovascular stenting for intracranial venous hypertension secondary to meningioma compression or invasion of venous sinuses, synthesizing outcomes from (n = 32) participants across eight publications and four institutional cases. The median age was 47.5 years, with 83.9% female participants. Complete symptom resolution occurred in 25 patients (78.1%) and partial resolution in seven patients (21.9%), while papilledema resolved in 84.4% of cases over a median 27-month follow-up. Stent deployment was technically successful in all patients, with no reported procedural or delayed complications. Clinical recurrence requiring further endovascular treatment occurred in 31.3% of patients, and 12 patients received adjuvant stereotactic radiosurgery. These results support endovascular stenting as a promising treatment option for meningioma-related venous hypertension, although the observed recurrence rate highlights the need for ongoing surveillance and further research (Courret, 2025). No policy changes were warranted.

In 2026, we added a prospective multicenter trial of a dedicated venous sinus stent (Patsalides, 2026), a large propensity-matched comparative cohort (Intrapiromkul, 2025), and two systematic reviews (Christie, 2026; Figueroa-Sanchez, 2026), and we reviewed the 2025 consensus recommendations of the Austrian network for idiopathic intracranial hypertension (Bsteh, 2025). The new evidence, though increasingly favorable in selected patients, remains non-randomized or of very low certainty, and the most recent international consensus continues to classify venous sinus stenting as experimental (Bsteh, 2025). No policy changes are warranted.

## References

On June 11, 2026, we searched PubMed and the databases of the Cochrane Library, the U.K. National Health Services Centre for Reviews and Dissemination, the Agency for Healthcare Research and Quality, and the Centers for Medicare & Medicaid Services. Search terms were “intracranial hypertension (MeSH),” “stents (MeSH),” “idiopathic intracranial hypertension,” “pseudotumor cerebri,” “benign intracranial hypertension,” and “stent.” We included the best available evidence according to established evidence hierarchies (typically systematic reviews, meta-analyses, and full economic analyses, where available) and professional guidelines based on such evidence and clinical expertise.


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## Policy updates

7/2021: initial review date and clinical policy effective date: 8/2021

7/2022: Policy references updated.

7/2023: Policy references updated.

7/2024: Policy references updated.

7/2025: Policy references updated.

7/2026: Policy references updated.

## Related codes

Below are the most commonly submitted codes for the service(s)/item(s) subject to this policy CCP.1493 .This is not an exhaustive list of codes. Providers are expected to consult the appropriate coding manuals and bill accordingly.

| Code | Code description |
|---|---|
| 64999 | Unlisted procedure, nervous system |
| 37238 | Transcatheter placement of intravascular stent(s), open or percutaneous, including radiological supervision and interpretation and including angioplasty within the same vessel, when performed; initial vein |
| 37239 | Transcatheter placement of intravascular stent(s), open or percutaneous, including radiological supervision and interpretation and including angioplasty within the same vessel, when performed; each additional vein (List separately in addition to code for primary procedure) |
| 61635 | Transcatheter placement of intravascular stent(s), intracranial (eg, atherosclerotic intracranial stenosis), including balloon angioplasty, when performed (reported by some payers; descriptor is for intracranial arterial stenting) |
| 36012 | Selective catheter placement, venous system; second order, or more selective, branch (eg, left adrenal vein, petrosal sinus) |
| 75870 | Venography, superior sagittal sinus, radiological supervision and interpretation |